

2009 NATEF CROSSWALK

School Name:

Date:

I. STRUCTURAL ANALYSIS AND DAMAGE REPAIR

A. Frame Inspection and Repair

1. Measure and diagnose structural damage using a tram gauge. HP-I
DAM02 v.2.1 module 1 DAM02 v.2.2 modules 2, 3 MEA01 modules 1, 2
 2. Attach vehicle to anchoring devices. HP-I
MEA01 module 6 SSS01 module 2
 3. Analyze, straighten, and align mash (collapse) damage. HP-G
MEA01 module 4 SSS01 module 5
 4. Analyze, straighten, and align say damage. HP-G
MEA01 module 4 SSS01 module 5
 5. Analyze, straighten, and align sidesway damage. HP-G
MEA01 module 4 SSS01 module 5
 6. Analyze, straighten, and align twist damage. HP-G
MEA01 module 4 SSS01 module 5
 7. Analyze, straighten, and align diamond frame damage. HP-G
MEA01 module 4 SSS01 module 5
 8. Remove and replace damaged structural components. HP-G
SPS03 modules 3, 5
 9. Restore corrosion protection to repaired or replaced frame areas. HP-I
CPS01 module 3
 10. Analyze and identify misaligned or damaged steering, suspension, and power steering, and wheel alignment problems. HP-G
DAM03 v.2.2 modules 4, 6 DAM03 v.2.4 module 6 DAM06 module 2
 11. Align or replace misaligned or damaged steering, suspension, and power steering, and wheel alignment problems. HP-G
DRT01 module 5 STE01 module 3 STE02 modules 1, 2, 3 STE03 modules 1, 2
 12. Identify heat limitations for structural components. HP-I
FCR01 module 1 SPS07 modules 1, 2 SSS01 module 4
 13. Demonstrate an understanding of structural foam applications. HP-G
FOM01 modules 1, 2, 3, 4
 14. Measure and diagnose structural damage using a three-dimensional measure. HP-G
DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2
 15. Measure and diagnose structural damage to vehicles using a dedicated (fire) camera. HP-I
MEA01 module 2
 16. Determine the extent of the direct and indirect damage and the direction and sequence of repair. HP-I
DAM02 v.2.1 modules 1, 3 DAM02 v.2.2 module 2 FCR01 v.2.1 module 1
 17. Analyze and identify crush/collapse zones. HP-I
SPS03 module 3 SPS08 modules 1, 3
 18. Restore mounting and anchoring locations. HP-G
CPS01 modules 1, 2, 3

B. Unibody and Unitized Structure Inspection, Measurement, and Repair

1. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems. HP-G

Classroom Hours	Lab Hours	Total Hours

2. Realign or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems. HP-G
DRT01 module 5 STE01 module 3 STE02 modules 1, 2, 3 STE03 modules 1, 2, 3, 4
 3. Measure and diagnose unibody damage using a tram gauge. HP-I
MEA01 modules 1, 2
 4. Determine and inspect the locations of all suspension, steering, and powertrain component attaching points on the vehicle. HP-G
DAM03 module 6 DAM06 module 2 DRT01 modules 2, 5 MEA01 module 6 STE01 module 3 STE02 modules 1, 2, 3 STE03 modules 1, 2, 3
 5. Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system. HP-G
MEA01 module 2
 6. Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, laser, etc.). HP-G
DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2
 7. Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair. HP-I
DAM02 v.2.1 modules 1, 3 DAM02 v.2.2 module 2 FCR01 v.2.1 module 2 FCR01 v.2.2 modules 2, 3 SSS01 module 1
 8. Attach anchoring devices to vehicle; remove or reposition components as necessary. HP-I
MEA01 module 6 SSS01 module 2
 9. Straighten and align cowl assembly. HP-G
SPS02 v.3.1 module 3 SPS02 v.3.2 modules 1, 2 SSS01 module 5
 10. Straighten and align roof rails/headers and roof panels. HP-G
EXT02 module 4 SSS01 module 5
 11. Straighten and align hinge and lock pillars. HP-G
SPS02 v.3.1 modules 3, 4 SPS02 v.3.2 modules 1, 2 SSS01 module 5
 12. Straighten and align vehicle openings, floor pans, and rocker panels. HP-G
SPS01 v.3.1 modules 2, 3, 4, 6 SPS01 v.3.2 modules 1, 2 SPS02 v.3.1 modules 2, 3, 4, 5 SPS02 v.3.2 modules 1, 2, 3 SSS01 module 5
 13. Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points). HP-G
EXT02 module 5 SPS01 v.3.1 modules 3, 7 SPS01 v.3.2 modules 1, 2 SSS01 module 5
 14. Straighten and align front-end sections (aprongs, strut towers, upper and lower rails, steering, and suspension/powertrain mounting points, etc.). HP-G
SPS01 v.3.1 modules 3, 4 SPS01 v.3.2 modules 1, 2 SSS01 module 5
 15. Identify substrate and repair or replacement recommendations. HP-I
FCR01 module 1 SPS07 modules 1, 2
 16. Identify proper cold stress relief methods. HP-I
SSS01 module 4
 17. Repair damage using power tools and hand tools to restore proper contours and dimensions. HP-I
SSS01 module 5
 18. Remove and replace damaged sections of steel body structures. HP-G
SPS01 v.3.1 modules 3, 6 SPS01 v.3.2 modules 1, 2 SPS02 v.3.1 modules 2, 3, 4, 5 SPS02 v.3.2 modules 1, 2
 19. Restore corrosion protection to repaired or replaced structural areas. HP-I
CPS01 module 3
 20. Determine the extent of damage to aluminum structural components; repair, weld, or replace. HP-G
DAM05 module 3 SPA01 modules 1, 2 SPA02 modules 1, 2 SSA01 modules 1, 2, 3
 21. Analyze and identify crush/collapse zones. HP-I
SPS01 v.3.1 modules 1, 4, 6 SPS01 v.3.2 modules 1, 2
 22. Restore mounting and anchoring locations. HP-G
CPS01 modules 1, 2, 3

C. Fixed Glass

1. Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials and techniques. HP-G
GLA02 modules 1, 2, 3 PWR01 module 3
 2. Remove and reinstall or replace modular glass using recommended materials. HP-G
GLA02 module 3

3.	Check for water leaks, dust leaks, and wind noise. HP-G WNW01 module 1				Total Hours by NATEF Sub Topic			
						Classroom Hours	Lab Hours	Total Hours
	Metal Welding and Cutting							
1.	Identify weldable and non-weldable substrates used in vehicle construction. HP-I FCR01 module 1							
2.	Weld and cut high-strength steel and other steels. HP-I SPS07 modules 1, 2 WCS01 v.1.2 modules 1, 2, 3, 4 WCS01 v.1.3 modules 1, 2, 3, 4, 5							
3.	Weld and cut aluminum. HP-G WCA01 modules 1, 2							
4.	Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation. HP-I WCS01 module 1							
5.	Set up and adjust the GMAW (MIG) welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded. HP-I WCS01 module 1							
6.	Store, handle, and install high-pressure gas cylinders. HP-I WCS01 module 1							
7.	Determine work clamp (ground) location and attach. HP-I WCS01 module 1							
8.	Use the proper angle of the gun to the joint and the direction of the gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions. HP-I WCS01 v.1.2 module 1 WCS01 v.1.3 modules 1, 2, 3, 4, 5							
9.	Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. HP-I WCS01 module 1							
10.	Protect computers and other electronic control modules during welding procedures. HP-I WCS01 module 1							
11.	Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required. HP-I WCS01 module 1							
12.	Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I SPS01 v.3.1 module 1 SPS01 v.3.2 modules 1, 2 SPS02 v.3.1 module 1 SPS02 v.3.2 module 2 SPS03 modules 2, 3							
13.	Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. HP-I SPS01 v.3.1 module 1 SPS01 v.3.2 modules 1, 2 SPS02 v.3.1 module 1 SPS02 v.3.2 module 2 SPS03 modules 2, 3							
14.	Perform the following welds: continuous, plug, butt weld with and without backing, and fillet etc. HP-I WCS01 v.1.2 modules 2, 3, 4 WCS01 v.1.3 modules 1, 2, 3, 4, 5							
15.	Perform visual and destructive tests on each weld type. HP-I WCS01 v.1.2 modules 2, 3, 4 WCS01 v.1.3 modules 2, 3, 4, 5							
16.	Identify the causes of various welding defects; make necessary adjustments. HP-I WCS01 v.1.2 module 1 WCS01 v.1.3 modules 1, 2, 3, 4, 5							
17.	Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. HP-I WCS01 module 1							
18.	Identify cutting process for different substrates and locations; perform cutting operation. HP-I SPS07 modules 1, 2 WCS05 module 4							
19.	Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, silicone bronze, etc.) HP-G FCR01 module 1							

II. NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)

A. Preparation

- Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document repair plan. HP-I
DAM01 v.2.4 modules 1, 2 DAM01 v.2.5 modules 1, 2, 3, 4, 5 EXT01 module 1

Classroom Hours	Lab Hours	Total Hours

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| 2. Inspect, remove, store, and replace exterior trim and moldings. HP-I
DAM04 v.2.1 module 4 DAM04 v.2.2 module 3 TRM01 modules 3, 6, 7 | | |
| 3. Inspect, remove, store, and replace interior trim and components. HP-I
DAM04 v.2.1 module 1 DAM04 v.2.2 modules 1, 2 TRM01 module 5 | | |
| 4. Inspect, remove, store, and replace body panels and components that may interfere with or be damaged during repair.
HP-I
DAM02 v.2.1 modules 2, 3 DAM02 v.2.2 module 2 DAM04 v.2.1 module 3 DAM04 v.2.2 modules 2, 3 EXT01 modules 1, 2, 3, 4, 5 | | |
| 5. Inspect, remove, store, and replace vehicle mechanical and electrical components that may interfere with or be damaged during repair. HP-G
DAM03 v.2.2 modules 1, 2, 3, 4, 5, 6 DAM03 v.2.4 modules 1, 7 DAM04 modules 1, 2, 3 DAM06 module 2 EXT01 module 3 | | |
| 6. Protect panels, glass, and parts, and other vehicles adjacent to repair area. HP-I
EXT01 module 1 EXT02 modules 1, 2, 3, 4, 5 | | |
| 7. Soap and water wash entire vehicle for inspection. HP-I
EDS02 module 3 REF02 module 1 REF04 module 1 | | |
| 8. Prepare damaged area using water-based and solvent-based cleaners. HP-I
EDS02 module 3 REF02 module 1 REF04 module 1 | | |
| 9. Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs. HP-I
DAM02 v.2.1 module 2 DAM02 v.2.2 module 1 EXT01 modules 1, 2, 3, 4 EXT02 modules 1, 2, 3, 4, 5 | | |
| 10. Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair. HP-I
DAM02 v.2.1 module 2 DAM02 v.2.2 module 1 EXT01 modules 1, 2, 3, 4 EXT02 modules 1, 2, 3, 4, 5 | | |

Total Hours by NATEF Sub Topic

B. Outer Body Panel Repairs, Replacements, and Adjustments

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|---|-----------------|-----------|-------------|
| 1. Determine the extent of direct (primary) and indirect (secondary) damage and direction of impact; develop and document a repair plan. HP-I
DAM02 v.2.1 modules 1, 3 DAM02 v.2.2 module 2 EDS01 module 2 FCR01 v.2.1 module 2 FCR01 v.2.2 modules 2, 3 STS01 modules 1, 2 | | | |
| 2. Inspect, remove, and replace bolted, bonded, and welded steel panel or panel assemblies. HP-G
ADH01 ADH01 v.1.3 modules 1, 2, 3 DAM02 v.2.1 modules 1, 2, 3 DAM02 v.2.2 module 2 EXT01 modules 1, 2, 3, 4 EXT02 modules 1, 2, 3, 4, 5 | | | |
| 3. Determine the extent of damage to aluminum body panels; repair or replace. HP-G
DAM05 module 2 PRA01 modules 1, 2, 3, 4, 5 STA01 modules 2, 3 | | | |
| 4. Inspect, remove, replace, and align hood, hood hinges, and hood latch. HP-I
DAM02 v.2.1 module 3 DAM02 v.2.2 module 2 EXT01 module 2 | | | |
| 5. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch. HP-I
DAM04 module 3 EXT01 module 4 | | | |
| 6. Inspect, remove, replace, and align doors, latches, hinges, and related hardware. HP-I
DAM04 modules 2, 3 EXT01 modules 3, 4 EXT02 module 2 | | | |
| 7. Inspect, remove, replace, and align tailgates, hatches, liftgates and sliding doors. HP-G
DAM04 modules 2, 3 EXT01 modules 3, 4 EXT02 module 2 | | | |
| 8. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware. HP-I
DAM02 module 2 EXT01 module 2 EXT02 module 5 | | | |
| 9. Inspect, remove, replace, and align fenders, and related panels. HP-I
DAM02 v.2.1 module 3 DAM02 v.2.2 module 2 EXT01 module 2 EXT02 module 5 | | | |
| 10. Straighten contours of damaged panel to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments. HP-I
EDS01 modules 2, 3 STS01 module 2 | | | |
| 11. Weld damaged or torn steel body panels; repair broken welds. HP-G
EDS01 module 3 | | | |
| 12. Restore corrosion protection. HP-I
CPS01 modules 3, 4 | | | |
| 13. Replace door skins. HP-G
ADH01 v.1.2 module 1 ADH01 v.1.3 modules 1, 2, 3 EXT02 module 2 | | | |
| 14. Restore sound deadeners and foam materials. HP-G
FOM01 modules 1, 2, 3, 4 | | | |
| 15. Perform panel bonding. HP-G
ADH01 v.1.2 module 1 ADH01 v.1.3 modules 1, 2, 3 | | | |

16. Diagnose and repair water leaks, dust leaks, and wind noise. HP-G
WNW01 modules 1, 2, 3
 17. Identify one-time use fasteners. HP-G

TRM01 module 1

Total Hours by NATEF Sub Topic			

C. Metal Finishing and Body Filling

1. Remove paint from the damaged area of a body panel. HP-I
EDS01 module 3 STS01 module 2
 2. Locate and repair surface irregularities on a damaged body panel. HP-I
DAM02 v.2.1 module 3 DAM02 v.2.2 module 2 EDS01 modules 2, 3, 4 FCR01 v.2.1 module 2 FCR01 v.2.2 module 3 STS01 modules 1, 2
 3. Demonstrate hammer and dolly techniques. HP-I
EDS01 module 2 STS01 module 2
 4. Heat shrink stretched panel areas to proper contour. HP-I
EDS01 module 2 STS01 module 2
 5. Cold shrink stretched panel areas to proper contour. HP-I
EDS01 module 2 STS01 module 2
 6. Mix and apply body filler. HP-I
EDS01 module 3 STS01 module 2
 7. Rough sand body filler to contour; finish sand. HP-I
EDS01 module 3 STS01 module 2
 8. Determine the proper metal finishing technique for aluminum. HP-G
DAM05 module 2 STA01 modules 2, 3
 9. Determine proper application of body filler to aluminum. HP-G
PRA01 modules 3, 5 STA01 module 2

Total Hours by NATEF Sub Topic

Classroom Hours	Lab Hours	Total Hours
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D. Moveable Glass and Hardware

1. Inspect, adjust, repair, or replace window regulators, run channels, glass, power mechanisms, and related controls. HP-I
DAM04 module 2 GLA01 module 2 PWR01 module 5
 2. Inspect, adjust, repair, remove, reinstall or replace weather-stripping. HP-G
DAM04 module 2 TRM01 module 3
 3. Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs. HP-G
DAM04 module 2 GLA01 module 4 PWR01 module 5
 4. Inspect, remove, reinstall, and align convertible top and related mechanisms. HP-G
DAM04 module 2

Total Hours by NATEF Sub Topic

Classroom Hours	Lab Hours	Total Hours
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E. Metal Welding and Cutting

- Identify weldable and non-weldable substrates used in vehicle construction. HP-I
EXT02 module 1 FCR01 module 1 SPS07 modules 1, 2
 - Weld and cut high-strength steel and other steels. HP-I
EXT02 module 1 WCS01 v.1.2 modules 1, 2, 3, 4 WCS01 v.1.3 modules 1, 2, 3, 4, 5
 - Weld and cut aluminum. HP-G
WCA01 modules 1, 2
 - Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation. HP-I
EXT02 module 1 WCS01 module 1
 - Set up and adjust the GMAW (MIG) welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded. HP-I
WCS01 module 1
 - Store, handle, and install high-pressure gas cylinders. HP-I
WCS01 module 1
 - Determine work clamp (ground) location and attach. HP-I
WCS01 v.1.2 module 1

8. Use the proper angle of the gun to the joint and the direction of the gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions. HP-I
WCS01 v.1.2 module 1 WCS01 v.1.3 modules 1, 2, 3, 4, 5
 9. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. HP-I
EXT02 modules 1, 2, 3, 4, 5 WCS01 module 1
 10. Protect computers and other electronic control modules during welding procedures. HP-I
WCS01 module 1
 11. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required. HP-I
WCS01 v.1.2 module 1
 12. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I
EXT02 modules 1, 2, 3, 4, 5
 13. Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. HP-I
EXT02 modules 1, 2, 3, 4, 5
 14. Perform the following welds: continuous, plug, butt weld with and without backing, fillet, etc. HP-I
WCS01 v.1.2 modules 2, 3, 4
 15. Perform visual and destructive tests on each weld type. HP-I
WCS01 v.1.2 modules 2, 3, 4
 16. Identify the causes of various welding defects; make necessary adjustments. HP-I
WCS01 v.1.2 module 1
 17. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. HP-I
WCS01 module 1
 18. Identify cutting process for different substrates and locations; perform cutting operation. HP-I
SPS07 modules 1, 2 WCS05 module 4
 19. Identify different methods of attaching non-structural components (squeeze type resistant spot welds (STRSW), riveting, non-structural adhesive, silicon bronze, etc.). HP-G
FCR01 module 1

Total Hours by NATEF Sub Topic

F. Plastics And Adhesives

1. Identify the types of plastics; determine repairability. HP-I
DAM02 module 2 PLA01 modules 1, 3 PLA02 modules 1, 4
 2. Clean and prepare the surface of plastic parts; identify the types of plastics repair procedures; . HP-I
PLA01 modules 1, 2 PLA02 modules 1, 2
 3. Repair rigid, semi-rigid, or flexible plastic panels. HP-I
PLA01 module 2 PLA02 modules 2, 3
 4. Remove or repair damaged areas from rigid exterior composite panels. HP-G
EXT02 module 2 PLA02 module 3
 5. Replace bonded rigid exterior composite body panels; straighten or align panel supports. HP-G
EXT02 module 2

Total Hours by NATEE Sub Topic

Total Hours by NATEF Topic

III. MECHANICAL AND ELECTRICAL COMPONENTS

A. Suspension and Steering

1. Identify one-time use fasteners. HP-I
STE02 module 1, 3
 2. Clean, inspect, and prepare reusable fasteners. HP-I
TRM01 module 1
 3. Remove, replace, inspect, or adjust power steering pump, pulleys, belts, hoses, fittings, and pump mounts. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE03 module 4
 4. Remove and replace power steering gear (non-rack and pinion type). HP-G
STE03 module 4
 5. Inspect, remove, and replace power rack and pinion steering gear and related components. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE03 module 4

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| 6. Inspect and replace parallelogram steering linkage components. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE03 module 2 | | |
| 7. Inspect, remove, and replace upper and lower control arms and related components. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 modules 1, 2 | | |
| 8. Inspect, remove, and replace steering knuckle/spindle/hub assemblies (including bearings, races, seals, etc.). HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE01 module 3 STE02 module 1 | | |
| 9. Inspect, remove, and replace front suspension system coil springs and spring insulators (silencers). HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 modules 1, 3 | | |
| 10. Inspect, remove, replace, and adjust suspension system torsion bars, and inspect mounts. HP-G
STE02 modules 1, 3 | | |
| 11. Inspect, remove, and replace stabilizer bar bushings, brackets, and links. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 module 1 | | |
| 12. Inspect, remove, and replace MacPherson strut cartridge or assembly, upper bearing, and mount. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 module 1 | | |
| 13. Inspect, remove, and replace rear suspension system transverse links, control arms, stabilizer bars, bushings, and mounts. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 module 2 | | |
| 14. Inspect, remove, and replace suspension system leaf spring(s) and related components. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 module 3 | | |
| 15. Inspect axle assembly for damage and misalignment. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 modules 1, 2 | | |
| 16. Inspect, remove, and replace shock absorbers. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE02 module 3 | | |
| 17. Diagnose, inspect, adjust, repair or replace active suspension systems and associated lines and fittings. HP-G
STE05 module 3 | | |
| 18. Measure vehicle ride height; determine needed repairs. HP-I
DAM03 v.2.2 module 6 DAM06 module 2 STE05 module 3 | | |
| 19. Inspect, remove, replace, and align front and rear frame (cradles/stub). HP-G
DAM03 module 6 | | |
| 20. Diagnose and inspect steering wheel, steering column, and components. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE03 module 1 | | |
| 21. Verify proper operation of steering system. HP-G
STE03 module 3 | | |
| 22. Diagnose non-MacPherson front and rear suspension system noises and body sway problems; determine needed repairs. HP-G
STE02 modules 1, 2 | | |
| 23. Diagnose vehicle wandering, pulling, hard steering, bump steer, memory steering, torque steering, and steering return problems; determine needed repairs. HP-G
DAM03 v.2.2 module 6 DAM06 module 2 STE04 module 5 | | |
| 24. Demonstrate an understanding of suspension and steering alignments (caster, camber, toe, SAI) etc. HP-G
STE04 module 4 | | |
| 25. Diagnose tire wear patterns; determine needed repairs. HP-I
DAM03 v.2.2 module 6 DAM06 module 2 STE01 module 2 | | |
| 26. Inspect tires, identify direction of rotation and location; check tire size, tire pressure monitoring system (TPMS) and adjust air pressure. HP-I
DAM03 v.2.2 module 6 DAM06 module 2 STE01 modules 1, 2, 3 | | |
| 27. Diagnose wheel/tire vibration, shimmy, tire pull (lead), wheel hop problems; determine needed repairs. HP-G
STE01 modules 1, 2 | | |
| 28. Measure wheel, tire, axle, and hub runout; determine needed repairs. HP-I
DAM03 v.2.2 module 6 DAM06 module 2 STE01 modules 1, 2, 3 | | |
| 29. Reinstall wheels and torque lug nuts. HP-I
STE01 module 2 | | |

Total Hours by NATEF Sub Topic

Classroom Hours	Lab Hours	Total Hours

B. Electrical

1. Check for available voltage, voltage drop and current in electrical wiring circuits and components with a DMM (digital multimeter). HP-I
ELE01 module 1 ELE02 module 1 LSC01 modules 1, 2, 3, 4

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| 2. Repair electrical circuits, wiring, and connectors. HP-I | | | |
| ELE01 module 2 LSC01 modules 1, 4 | | | |
| 3. Inspect, test, and replace fusible links, circuit breakers, and fuses. HP-I | | | |
| DAM03 module 3 ELE01 module 2 | | | |
| 4. Perform battery state-of-charge test and slow/fast battery charge. HP-I | | | |
| LSC01 module 1 | | | |
| 5. Inspect, clean, repair or replace battery, battery cables, connectors and clamps. HP-I | | | |
| DAM03 module 3 LSC01 module 1 | | | |
| 6. Dispose of batteries and battery acid according to local, state, and federal requirements. HP-G | | | |
| LSC01 module 1 | | | |
| 7. Identify programmable electrical/electronic components and check for malfunction indicator lamp (MIL); record data for reprogramming before disconnecting battery. HP-I | | | |
| ELE03 module 2 | | | |
| 8. Inspect alignment, adjust, remove and replace alternator (generator), driver belts, pulleys, and fans. HP-I | | | |
| LSC01 module 3 | | | |
| 9. Check operation and aim headlamp assemblies and fog/driving lamps; determine needed repairs. HP-I | | | |
| DAM03 module 3 LSC01 modules 4, 5 | | | |
| 10. Inspect, test, and repair or replace switches, relays, bulbs, sockets, connectors, and wires of interior and exterior light circuits. HP-I | | | |
| DAM03 module 3 ELE01 module 2 ELE02 module 3 LSC01 modules 4, 5 | | | |
| 11. Remove and replace horn(s); check operation. HP-I | | | |
| PWR01 module 7 | | | |
| 12. Check operation of wiper/washer system, determine needed repairs. HP-I | | | |
| PWR01 module 2 | | | |
| 13. Check operation of power side and tailgate window; determine needed repairs. HP-I | | | |
| GLA01 modules 2, 3 PWR01 module 6 | | | |
| 14. Inspect, remove, and replace power seat, motors, linkages, cables, etc. HP-G | | | |
| PWR01 module 4 | | | |
| 15. Inspect, remove, and replace components of electric door and hatch/trunk lock. HP-G | | | |
| ELE02 module 3 PWR01 module 6 | | | |
| 16. Inspect, remove, and replace components of electric door and hatch/trunk lock. HP-G | | | |
| DAM03 v.2.4 module 5 PWR01 module 5 | | | |
| 17. Inspect, remove, and replace components of electrical sunroof and convertible/retractable hard top. HP-G | | | |
| DAM04 module 2 GLA01 module 4 | | | |
| 18. Check operation of electrically heated mirrors, windshields, back lights, panels, etc.; determine needed repairs. HP-I | | | |
| DAM04 v.2.1 modules 2, 3 DAM04 v.2.2 module 2 GLA02 module 3 PWR01 module 3 | | | |
| 19. Demonstrate the proper self-grounding procedures for handling electronic components. HP-I | | | |
| ELE02 module 4 | | | |
| 20. Check for module communications errors using a scan tool. HP-G | | | |
| ELE03 module 1 | | | |
| 21. Use wiring diagrams and diagnostic flow charts during diagnosis of electrical circuit problems. HP-G | | | |
| ELE01 module 2 | | | |
| 22. Demonstrate safe disarming techniques of high voltage systems on hybrid vehicles. HP-G | | | |
| ALT01 module 3 ALT02 module 2 | | | |
| 23. Identify potential safety and environmental concerns associated with hybrid vehicle systems. HP-G | | | |
| ALT01 module 3 ALT02 modules 1, 3 | | | |

Total Hours by NATEF Sub Topic

C. Brakes

- | | Classroom Hours | Lab Hours | Total Hours |
|--|-----------------|-----------|-------------|
| 1. Inspect brake lines, hoses, and fittings for leaks, dents, kinks, rust, cracks or wear; tighten fittings and supports; replace brake lines (double flare and ISO types), hoses, fittings, seals, and supports. HP-I | | | |
| BRA01 module 1 DAM03 v.2.2 module 5 DAM03 v.2.4 module 7 | | | |
| 2. Identify, handle, store, and install appropriate brake fluids; dispose of in accordance with federal, state, and local regulations. HP-G | | | |
| BRA01 module 1 | | | |
| 3. Bleed (manual, pressure, vacuum or surge) hydraulic brake system. HP-I | | | |
| BRA01 module 1 | | | |

4. Pressure test brake hydraulic system; determine needed repair. HP-G
ABR01 module 2
 5. Adjust brake shoes; remove and reinstall brake drums or drum/hub assemblies and wheel bearings. HP-I
BRA01 module 2
 6. Remove, clean and inspect caliper assembly and mountings for wear and damage; reinstall. HP-I
ALT02 module 2
 7. Check parking brake system operation. HP-I
ABR01 module 1 BRA01 module 3
 8. Identify the proper procedures for handling brake dust. HP-G
BRA01 module 2
 9. Check for bent or damaged brake system components. HP-G
ABR01 module 1 BRA01 module 2 DAM03 v.2.2 module 5 DAM03 v.2.4 module 7
 10. Demonstrate an understanding of various types of advanced braking systems (ABS, hydraulic, electronic, traction control). HP-G
ABR01 modules 1, 2, 3, 4

Total Hours by NATEF Sub Topic

D. Heating and Air Conditioning

- Identify and comply with environmental concerns relating to refrigerants and coolants. HP-G
AIR01 modules 2, 3 HEA01 module 4 WKR01 module 6
 - Maintain and verify correct operation of certified refrigerant recovery and recharging equipment. HP-G
AIR01 modules 2, 3
 - Locate and identify A/C system service ports. HP-I
AIR01 module 3 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Identify, recover, label and store refrigerant from A/C system. HP-G
AIR01 module 4 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Recycle refrigerant in accordance with EPA regulations. HP-G
AIR01 module 4 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Evacuate and recharge A/C system; check for leaks. HP-I
AIR01 module 4
 - Identify oil type and maintain correct amount in A/C system. HP-G
AIR01 module 2
 - Inspect, adjust, and replace A/C compressor drive belts; check pulley alignment. HP-G
AIR01 module 5 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Remove and replace A/C compressor; inspect, repair, or replace A/C compressor mount. HP-G
AIR01 module 5 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Inspect, repair, or replace A/C system mufflers, hoses, lines, fittings, orifice tube, expansion valve, and seals. HP-G
AIR01 module 5 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Inspect, test, and replace A/C system condenser and mounts. HP-G
AIR01 module 5 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Inspect and replace receiver/drier or accumulator/drier. HP-G
AIR01 module 5 DAM03 v.2.2 module 1 DAM03 v.2.4 module 2
 - Inspect and repair A/C component wiring. HP-G
AIR01 module 6 ELE01 modules 1, 2
 - Demonstrate an understanding of safe handling procedures associated with high voltage A/C compressors and wiring. HP-G
ALT02 module 1

Total Hours by NATEF Sub Topic

E. Cooling Systems

1. Check engine cooling and heater system hoses and belts; determine needed repairs. HP-I
DAM03 v.2.2 module 1 DAM03 v.2.4 modules 1, 2 HEA01 modules 3, 7
 2. Inspect, test, remove, and replace radiator, pressure cap, coolant recovery system, and water pump. HP-G
DAM03 module 1 HEA01 module 2
 3. Recover, refill, and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA specifications. HP-I
DAM03 module 1 HEA01 modules 4, 7

Classroom Hours	Lab Hours	Total Hours

4. Remove, inspect and replace fan (both electrical and mechanical), fan sensors, fan pulley, fan clutch, and fan shroud; check operation. HP-G
HEA01 module 1
 5. Inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels. HP-G
HEA01 module 5
 6. Demonstrate an understanding of hybrid cooling systems. HP-G
AIT01 module 1

F. Drive Train

1. Remove, replace, and adjust shift or clutch linkage as required. HP-G
DRT01 module 3
 2. Remove, replace, and adjust cables or linkages for throttle valve (TV), kickdown, and accelerator pedal. HP-G
DRT01 module 3
 3. Remove and replace electronic sensors, wires, and connectors. HP-G
ELE01 modules 1, 2 ELE02 module 1
 4. Remove and replace powertrain assembly; inspect, replace, and align powertrain mounts. HP-G
DAM03 v.2.2 module 4 DAM03 v.2.4 module 6 DRT01 module 2
 5. Remove and replace drive axle assembly. HP-G
DRT01 module 4
 6. Inspect, remove and replace half shafts and axle constant velocity (CV) joints. HP-G
DAM03 v.2.2 module 4 DAM03 v.2.4 module 6 DRT01 module 4
 7. Inspect, remove and replace drive shafts and universal joints. HP-G
DAM03 v.2.2 module 4 DAM03 v.2.4 module 6 DRT01 module 4

Total Hours by NATEF Sub Topic

G. Fuel, Intake and Exhaust Systems

1. Inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields. HP-G
DAM03 v.2.2 module 3 DAM03 v.2.4 modules 3, 6 DRE01 module 1 FUE01 module 2
 2. Inspect, remove and replace fuel tank, tank filter, cap, filler hose, pump/sending unit and inertia switch; inspect and replace fuel lines and hoses. HP-G
DAM03 v.2.2 module 3 DAM03 v.2.4 module 6 DRE01 module 2 FUE01 module 1
 3. Inspect, remove and replace engine components of air intake systems. HP-G
DRE01 modules 1, 2
 4. Inspect, remove and replace canister, filter, vent, and purge lines of fuel vapor (EVAP) control systems. HP-G
DRE01 module 2 FUE01 module 1

Total Hours by NATEEF Sub Topic

H. Restraint Systems

1. Identify vehicle manufacturer's SRS recommended procedures before inspecting or replacing components. HP-I
DAM04 v.2.2 module 1 RES01 modules 1, 2, 3, 4, 5, 6 RES02 modules 1, 2, 3, 4
 2. Inspect, remove, and replace seatbelt and shoulder harness assembly and components. HP-G
DAM04 module 1 RES01 modules 3, 4
 3. Inspect restraint system mounting areas for damage; repair as needed. HP-G
DAM04 module 1 RES01 module 3
 4. Verify proper operation of seatbelt. HP-I
RES01 module 3
 5. Deactivate and reactivate Supplemental Restraint System (SRS). HP-G
RES01 module 1
 6. Inspect, remove, and replace Supplemental Restraint System (SRS) sensors and wiring; ensure sensor orientation. HP-G
DAM04 module 1 RES01 module 1
 7. Verify that Supplemental Restraint System (SRS) is operational. HP-I
RES01 module 2
 8. Inspect, remove, replace and dispose of deployed and non-deployed airbag(s) and pretensioners. HP-G
DAM04 module 1 RES01 modules 1, 4
 9. Use Diagnostic Trouble Codes (DTC) to diagnose and repair the Supplemental Restraint System (SRS). HP-G
RES01 module 2

14. Remove dust from area to be refinished, including cracks or moldings of adjacent areas. HP-I
EDS02 module 3 REF02 module 4 REF03 modules 3, 4
15. Clean area to be refinished using a final cleaning solution. HP-I
EDS02 module 3 REF03 module 3
16. Remove, with a tack rag, any dust or lint particles from the area to be refinished. HP-I
EDS02 module 5 REF02 modules 3, 4 REF03 module 4
17. Apply suitable sealer to the area being refinished. HP-I
EDS02 module 4 REF03 module 4
18. Scuff sand to remove nibs or imperfections from a sealer. HP-I
EDS02 module 4
19. Apply stone chip-resistant coating. HP-G
CPS01 module 4 EDS02 module 5 REF03 module 3
20. Restore corrosion-resistant coatings, caulking, and seam sealers to repaired areas. HP-G
CPS01 modules 3, 4 EDS02 modules 4, 5 REF02 module 5
21. Prepare adjacent panels for blending. HP-I
EDS02 module 5 REF02 modules 4, 5
22. Identify the types of rigid, semi-rigid, or flexible plastic parts to be refinished; determine the materials, preparation, and refinishing procedures. HP-I
EDS02 module 5 REF02 module 4
23. Identify aluminum parts to be refinished; determine the materials, preparation, and refinishing procedures. HP-G
EDS02 module 4 REF02 modules 1, 4

Total Hours by NATEF Sub Topic

Classroom Hours	Lab Hours	Total Hours
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C. Spray Gun and Related Equipment Operation

1. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment). HP-I
EDS02 module 2 REF01 module 1
2. Check and adjust spray gun operation for HVLP (high volume, low pressure) or compliant spray guns. HP-I
EDS02 module 2 REF01 module 1 REF02 module 3
3. Set-up (fluid needle, nozzle, and cap), test, and adjust spray gun using fluid, air, and pattern control valves. HP-I
EDS02 module 2 REF01 module 1 REF02 module 3
4. Demonstrate an understanding of the operation of pressure spray equipment. HP-G
EDS02 module 2 REF01 module 1

Total Hours by NATEF Sub Topic

Classroom Hours	Lab Hours	Total Hours
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D. Paint Mixing, Matching, and Applying

1. Identify type and color code by manufacturer's vehicle information label. HP-I
DAM01 module 4 EDS02 module 3 REF03 module 1
2. Shake, stir, reduce, catalyze/activate, and strain refinish materials. HP-I
EDS02 modules 2, 4 REF03 module 4
3. Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied. HP-I
EDS02 module 2 REF02 module 3
4. Apply selected product on test and let-down panel; check for color match. HP-I
REF03 module 2
5. Apply single stage topcoat. HP-I
EDS02 module 5 REF03 module 4
6. Apply basecoat/clearcoat for panel blending or panel refinishing. HP-I
EDS02 module 5 REF03 modules 3, 4
7. Apply basecoat/clearcoat for overall refinishing. HP-G
EDS02 module 5 REF03 module 4
8. Remove nibs or imperfections from basecoat. HP-I
REF04 module 2
9. Refinish rigid or semi-rigid plastic parts. HP-G
EDS02 module 5 REF03 modules 3, 4
10. Refinish flexible plastic parts. HP-I
EDS02 module 5 REF03 modules 3, 4

Classroom Hours	Lab Hours	Total Hours
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11.	Apply multi-stage coats for panel blending or overall refinishing. HP-G EDS02 module 5 REF03 module 4		
12.	Identify and mix paint using a formula. HP-I EDS02 module 4 REF01 module 5		
13.	Identify poor hiding colors, determine necessary action. HP-G EDS02 module 6 REF03 module 3		
14.	Tint color using formula to achieve a blendable match. HP-I REF03 module 5		
15.	Identify alternative color formula to achieve a blendable match. HP-I REF03 module 2		

E. Paint Defects—Causes and Cures

- Identify blistering (raising of the paint surface, air entrapment); determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 3
 - Identify blushing (milky or hazy formation); determine the cause(s) and correct the condition. HP-G
EDS02 module 6
 - Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 3
 - Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition. HP-I
EDS02 module 6 REF03 module 3
 - Identify lifting; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 3
 - Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition. HP-I
EDS02 module 6
 - Identify orange peel; determine the cause(s) and correct the condition. HP-I
EDS02 module 6 REF03 module 3 REF04 module 2
 - Identify overspray; determine the cause(s) and correct the condition. HP-I
DAM01 v.2.4 module 3 DAM01 v.2.5 module 4 EDS02 module 6 REF04 module 2
 - Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 3
 - Identify sags and runs in paint surface; determine the cause(s) and correct the condition. HP-I
EDS02 module 6 REF03 module 3 REF04 module 2
 - Identify sanding marks or sandscratch swelling; determine the cause(s) and correct the condition. HP-G
DAM01 v.2.4 module 3 DAM01 v.2.5 module 4 EDS02 module 6 REF03 module 3 REF04 module 2
 - Identify contour mapping/edge mapping while finish is drying; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF02 module 1
 - Identify color difference (off-shade); determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 1
 - Identify tape tracking; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 3
 - Identify low gloss condition; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 3 REF04 module 2
 - Identify poor adhesion; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF03 module 3
 - Identify paint cracking (shrinking, splitting, crowsfeet or line-checking, micro-checking, etc.); determine the cause(s) and correct the condition. HP-G
EDS02 module 6
 - Identify corrosion; determine the cause(s) and correct the condition. HP-G
EDS02 module 6 REF02 module 3 REF03 module 3
 - Identify dirt or dust in the paint surface; determine the cause(s) and correct the condition. HP-I
DAM01 v.2.4 module 3 DAM01 v.2.5 module 4 EDS02 module 6 REF03 module 3 REF04 modules 1, 2
 - Identify water spotting; determine the cause(s) and correct the condition. HP-G
REF04 module 2
 - Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition. HP-G
DAM01 v.2.4 module 3 DAM01 v.2.5 module 4 REF04 module 2

22. Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition. HP-G

DAM01 v.2.4 module 3 DAM01 v.2.5 module 4 REF04 module 2

23. Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition. HP-G

EDS02 module 6 REE03 module 3

24. Identify chalking (oxidation); determine the cause(s) and correct the condition. HP-G

EDS02 module 6

25. Identify bleed-through (staining); determine the cause(s) and correct the condition. HP-G

EDS02 module 6

26. Identify pin-holing; determine the cause(s) and correct the condition. HP-G

EDS02 module 6

27. Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition. HP-I

RFF04 module 2

28. Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition. HP-G

EDS02 module 6 REF03 module 3

Total Hours by NATEF Sub Topic

E Final Detail

1. Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc. HP-G

TRM01 module 4

- 2 Buff and polish finish to remove defects as required. HP-J

REF04 module 2

- ### **REF 04 module 2**

REF04 module 3

- #### **REI 04 Module 3**

EE04 module 3

- ## **REF04 module 3**

EFS03 module 6 BEE04 module 3

- #### **EDS02 Module 8 KEP04 module 2**

PEE04 module 3

- REF04 module 3

Total Hours by NATEF Sub Topic

Total Hours by NATEF Topic

TOTAL HOURS OF ALL NATEF TOPICS

NATEF CROSSWALK

School Name:

Date:

I. STRUCTURAL ANALYSIS AND DAMAGE REPAIR

Total Hours by Topic	Classroom Hours	Lab Hours	Total Hours

II. NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)

Total Hours by Topic	Classroom Hours	Lab Hours	Total Hours

III. MECHANICAL AND ELECTRICAL COMPONENTS

Total Hours by Topic	Classroom Hours	Lab Hours	Total Hours

IV. PAINTING AND REFINISHING

Total Hours by Topic	Classroom Hours	Lab Hours	Total Hours

TOTAL HOURS OF ALL NATEF TOPICS

	Classroom Hours	Lab Hours	Total Hours